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(54) **TERMINAL CAPABLE OF EXTENDING  
STORAGE SPACE AND METHOD  
EXTENDING STORAGE SPACE THEREOF**

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**G06F 5/12** (2006.01)  
**G06F 13/16** (2006.01)  
**G06F 11/34** (2006.01)

(52) **U.S. Cl.**

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**G06F 2212/171** (2013.01)

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**G06F 2212/1041**; **G06F 2212/171**  
USPC ..... **711/154**, **158**  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

6,252,907	B1	6/2001	Hwang	
6,986,019	B1 *	1/2006	Bagashev et al.	711/217
2002/0124149	A1 *	9/2002	Ni	711/170
2003/0223415	A1 *	12/2003	Saxena et al.	370/389
2005/0060420	A1 *	3/2005	Kovacevic	709/231
2005/0152356	A1 *	7/2005	Powers	370/389
2005/0239494	A1 *	10/2005	Klassen et al.	455/550.1
2008/0133929	A1 *	6/2008	Gehrmann et al.	713/179
2010/0070695	A1 *	3/2010	Baek et al.	711/104
2011/0060669	A1 *	3/2011	Laves	705/34
2011/0064084	A1 *	3/2011	Tatar et al.	370/392
2011/0149777	A1 *	6/2011	Robbins	370/252
2011/0320718	A1 *	12/2011	Szakacsits	711/118
2012/0179884	A1 *	7/2012	Araki et al.	711/159

**FOREIGN PATENT DOCUMENTS**

KR 10-2006-0132147 12/2006

\* cited by examiner

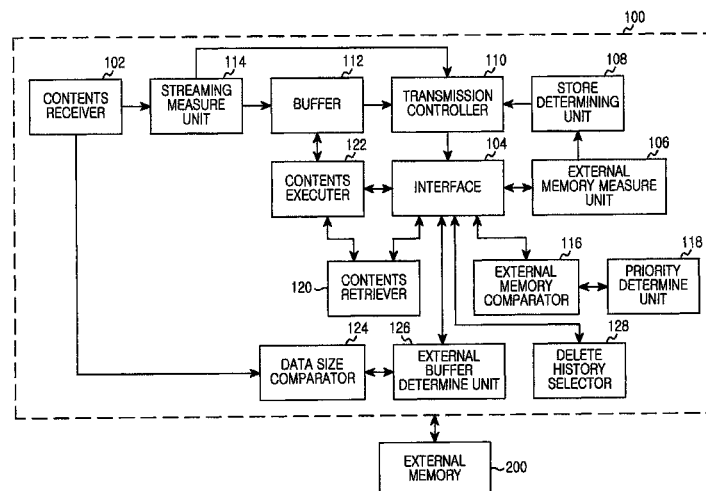
*Primary Examiner* — Hal Schnee

(57)

**ABSTRACT**

A terminal and a method extend a storage space. The terminal includes a contents receiver, an interface, an external memory measure unit, a store determining unit, and a transmission controller. The contents receiver receives contents via a network. The interface accesses at least one external memory. The external memory measure unit measures at least one of a speed of the interface, an available capacity and a use history of the external memory accessed via the interface. The store determining unit determines whether to store the contents in the external memory based on a value measured by the external memory measure unit. The transmission controller controls to transmit the contents to the external memory via the interface when it is determined that the contents are stored in the external memory.

**18 Claims, 4 Drawing Sheets**



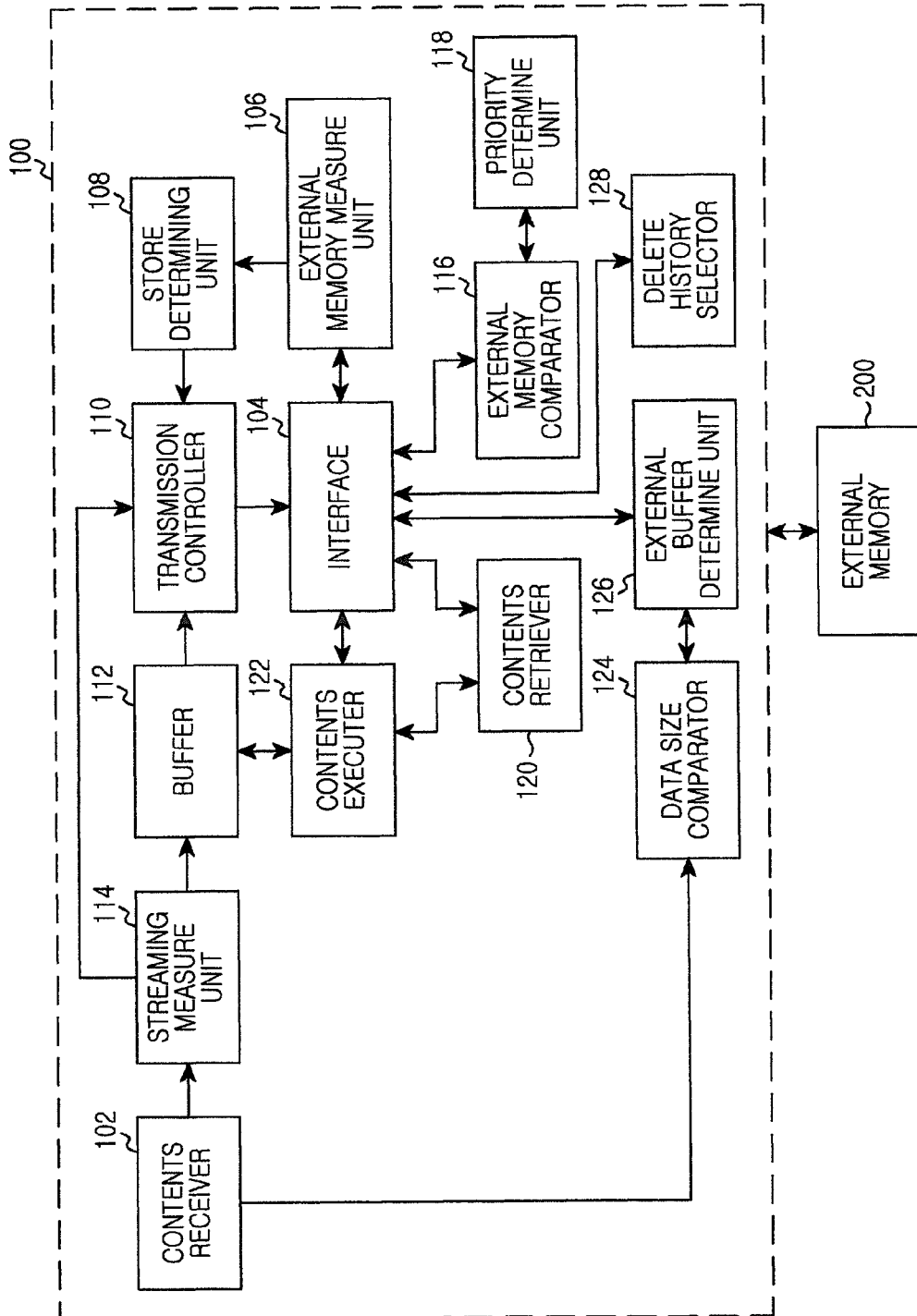


FIG.1

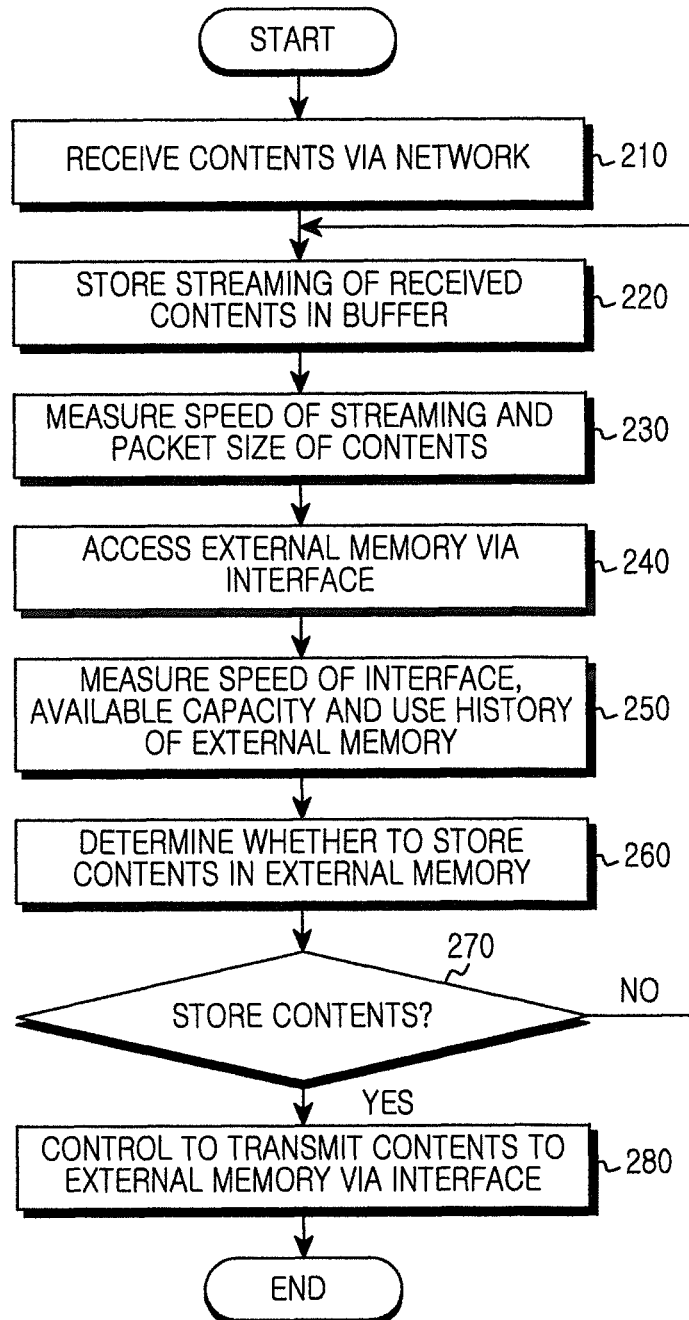


FIG.2

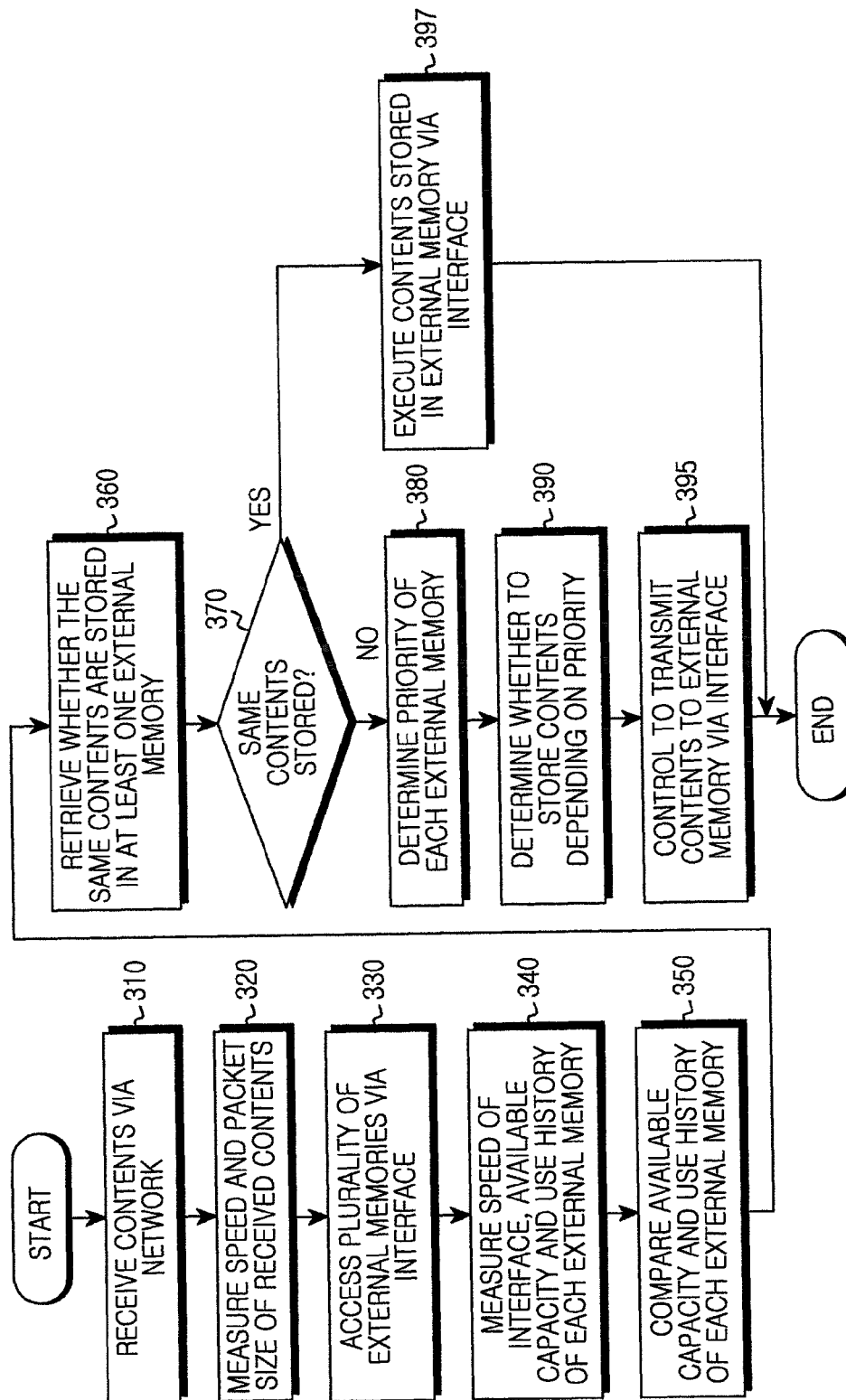


FIG. 3

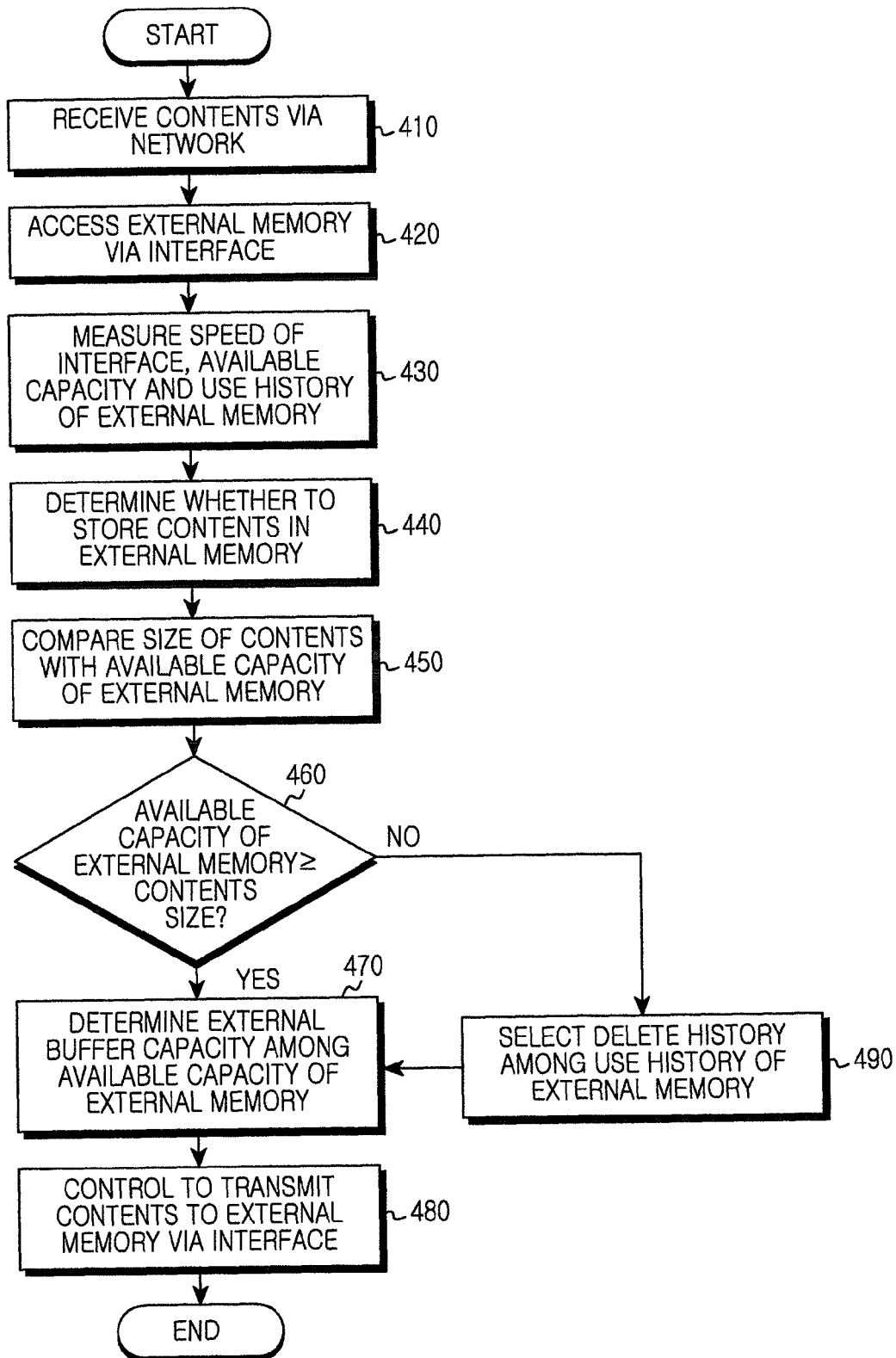


FIG.4

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# **TERMINAL CAPABLE OF EXTENDING STORAGE SPACE AND METHOD EXTENDING STORAGE SPACE THEREOF**

## **CROSS-REFERENCE TO RELATED APPLICATION(S) AND CLAIM OF PRIORITY**

The present application is related to and claims priority under 35 U.S.C. § 119(a) of a Korean patent application filed in the Korean Intellectual Property Office on Sep. 15, 2011 and assigned Ser. No. 10-2011-0092889, the contents of which are herein incorporated by reference.

## **TECHNICAL FIELD OF THE INVENTION**

The present disclosure relates to a terminal capable of extending a storage space and a method for extending a storage space thereof.

## **BACKGROUND OF THE INVENTION**

As a communication technology develops, not only a wired terminal such as a Personal Computer (PC) but also a wireless terminal such as a mobile phone, a smart phone, etc. can transmit/receive data in high speed via a network. More particularly, recently, it is possible to transmit/receive large capacity multimedia contents in real-time via the network.

Meanwhile, to receive and execute multimedia contents in real-time via the network, a buffer should be installed inside a terminal in order to solve a difference between an execution speed of the terminal and a communication speed of the network.

In case of a wireless terminal, an interference and collision of data may occur in a wireless section, and since a transmission speed of data is not constant depending on time and a place, a disconnection of contents data may occur while a terminal executes contents received via a wireless section.

In addition, in the case where a storage space of a memory installed inside a terminal is not sufficient, a difficulty may occur in securing an available capacity of a buffer inside a relevant memory in order to execute multimedia contents received in real-time.

## **SUMMARY OF THE INVENTION**

To address the above-discussed deficiencies of the prior art, it is a primary object to provide at least the advantages described below. Accordingly, an aspect of the present disclosure is to provide a terminal and a method for extending a storage space thereof, capable of preventing disconnection of contents by accessing an external memory via a Universal Serial Bus (USB) interface, a short distance wireless communication interface, a network interface, etc. installed in the terminal, and extending a buffer required for reproduction of contents using the accessed external memory when receiving and executing large capacity contents such as moving pictures, games, etc. via a network.

In accordance with an aspect of the present disclosure, a terminal capable of extending a storage space is provided. The terminal includes a contents receiver for receiving contents via a network, an interface for accessing at least one external memory, an external memory measure unit for measuring at least one of a speed of the interface, an available capacity and a use history of the external memory accessed via the interface, a store determining unit for determining whether to store the contents in the external memory based on a value measured by the external memory measure unit, and

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a transmission controller for controlling to transmit the contents to the external memory via the interface when it is determined that the contents are to be stored in the external memory.

5 The terminal may further include a buffer for storing a multimedia streaming for the received contents. In this example, the store determining unit may determine to store the contents in the external memory when a capacity of the buffer is insufficient.

10 The terminal may further include a streaming measure unit for measuring at least one of a speed and a packet size of a multimedia streaming for the received contents. In this example, the store determining unit may compare a value measured by the streaming measure unit with the value measured by the external memory measure unit to determine whether to store the contents on a packet basis.

The terminal may further include an external memory comparator for, when a plurality of memories are accessed via the interface, comparing at least one of an interface speed, an available capacity, and a use history of each external memory, and a priority determine unit for determining a priority of each external memory depending on the comparison result by the external memory comparator.

20 The terminal may further include a contents retriever for retrieving whether the same contents as the received contents are stored in the external memory.

The terminal may further include a contents execute unit for executing contents stored in the external memory via the interface.

30 The terminal may further include a data size comparator for comparing a size of the received contents with an available capacity of the external memory, and an external buffer determine unit for, when the available capacity of the external memory is equal to or greater than the size of the contents, determining a portion of the available capacity of the external memory to use as an external buffer.

The terminal may further include a delete history selector for, when the available capacity of the external memory is less than the size of the contents, selecting a history to delete among a use history of the external memory.

40 The interface may include at least one of a Universal Serial Bus (USB) interface for accessing the at least one external memory via a USB, a short distance wireless communication interface for accessing the at least one external memory using short distance wireless communication including at least one of Bluetooth, Infrared Data Association (IrDA), Zigbee, Ultra Wideband (UWB), and Near Field Communication (NFC), and a network interface for accessing a cloud server connected to the network using at least one of Wi-Fi, Code Division Multiple Access (CDMA), Wideband CDMA (WCDMA), Global System for Mobile Communication (GSM), Long Term Evolution (LTE), and Evolved Packet Core (EPC).

45 In accordance with another aspect of the present disclosure, a method for extending a storage space of a terminal is provided. The method includes receiving contents via a network, accessing at least one external memory connected via an interface, measuring at least one of a speed of the interface, an available capacity and a use history of the external memory accessed via the interface, determining whether to store the contents in the external memory based on a value measured in the measuring process, and when determining to store the contents in the external memory, controlling to transmit the contents to the external memory via the interface.

60 Here, the interface may include at least one of: a Universal Serial Bus (USB) interface for accessing the at least one external memory via a USB, a short distance wireless com-

munication interface for accessing the at least one external memory using short distance wireless communication including at least one of Bluetooth, Infrared Data Association (IrDA), Zigbee, Ultra Wideband (UWB), and Near Field Communication (NFC), and a network interface for accessing a cloud server connected to the network using at least one of Wi-Fi, Code Division Multiple Access (CDMA), Wideband CDMA (WCDMA), Global System for Mobile Communication (GSM), Long Term Evolution (LTE), and Evolved Packet Core (EPC).

The method may further include storing a multimedia streaming for the received contents in a buffer. In this example, the determining of whether to store the contents in the external memory may include storing the contents in the external memory when a capacity of the buffer is insufficient.

The method may further include measuring at least one of a speed and a packet size of a multimedia streaming for the received contents. In this example, the determining of whether to store the contents in the external memory may include comparing a value measured by the streaming measuring process with the value measured by the external memory measuring process to determine whether to store the contents on a packet basis.

The method may further include, when a plurality of memories are accessed via the interface, comparing at least one of an interface speed, an available capacity, and a use history of each external memory, and determining a priority of each external memory depending on the comparison result by the external memory comparing process.

The method may further include retrieving whether the same contents as the received contents are stored in the external memory.

The method may further include executing contents stored in the external memory via the interface.

The method may further include comparing a size of the received contents with an available capacity of the external memory, and when the available capacity of the external memory is equal to or greater than the size of the contents, determining a portion of the available capacity of the external memory to use as an external buffer.

The method may further include, when the available capacity of the external memory is less than the size of the contents, selecting a history to delete among a use history of the external memory.

Other aspects, advantages and salient features of the invention will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses exemplary embodiments of the invention.

Before undertaking the DETAILED DESCRIPTION OF THE INVENTION below, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms “include” and “comprise,” as well as derivatives thereof, mean inclusion without limitation; the term “or,” is inclusive, meaning and/or; the phrases “associated with” and “associated therewith,” as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present disclosure and its advantages, reference is now made to the follow-

ing description taken in conjunction with the accompanying drawings, in which like reference numerals represent like parts:

FIG. 1 illustrates a terminal capable of extending a storage space according to an exemplary embodiment of the present disclosure;

FIG. 2 illustrates a method for extending a storage space according to an exemplary embodiment of the present disclosure;

FIG. 3 illustrates a method for extending a storage space according to another exemplary embodiment of the present disclosure; and

FIG. 4 illustrates a method for extending a storage space according to another exemplary embodiment of the present disclosure.

Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

#### DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1 through 4, discussed below, and the various embodiments used to describe the principles of the present disclosure in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the disclosure. Those skilled in the art will understand that the principles of the present disclosure may be implemented in any suitably arranged wireless communication system. Embodiments of the present disclosure will be described herein below with reference to the accompanying drawings.

Preferred embodiments of the present disclosure will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the disclosure in unnecessary detail. And, terms described below, which are defined considering functions in the present disclosure, can be different depending on user and operator's intention or practice. Therefore, the terms should be defined based on the disclosure throughout this specification.

FIG. 1 illustrates a terminal capable of extending a storage space according to an exemplary embodiment of the present disclosure.

Referring to FIG. 1, the terminal 100 may include a contents receiver 102, an interface 104, an external memory measure unit 106, a store determining unit 108, and a transmission controller 110.

In addition, the terminal 100 may further include a buffer 112, a streaming measure unit 114, an external memory comparator 116, a priority determine unit 118, a contents retriever 120, a contents executor 122, a data size comparator 124, an external buffer determine unit 126, and a delete history selector 128.

The contents receiver 102 may receive contents such as moving pictures, sounds, an image, etc. via a network or execute game contents together with a different terminal. Here, the network generally denotes a communication network such as CDMA, WCDMA, GSM, LTE, EPC, an access network of the next generation mobile communication system to be realized in the future, and a cloud computing access network between a cloud computing service providing apparatus and a terminal as well as the Internet network. The cloud computing denotes a computer environment where information is eternally stored in a server on the Internet and temporarily stored in a client terminal such as a desktop computer, a tablet computer, a notebook, a netbook, a smart phone, etc. A cloud computing access network denotes a computer environment access network for storing all information of a user

in a server on the Internet and allowing a user to use this information via various Information Technology (IT) apparatuses any time, anywhere.

The interface **104** may access at least one external memory **200**. Here, the interface **104** includes a short distance wireless communication interface for accessing the external memory **200** in a short distance wirelessly using short distance wireless communication such as Bluetooth, IrDA, Zigbee, UWB, NFC, etc., and a network interface for accessing a cloud server connected to a network using Wi-Fi, CDMA, WCDMA, GSM, LTE, EPC, etc. as well as a USB interface for accessing an external memory **200** directly connected with the terminal **100** via USB. At this point, the interface **104** may try an access by turning on the power of the terminal **100**, or inserting a USB memory into a USB interface of the terminal **100**, or periodically retrieving an external terminal **200** that can be communicated, existing within a predetermined range. This external memory accessing method uses a known method and detailed description thereof is omitted.

The external memory measure unit **106** measures at least one of a speed of the interface **104**, an available capacity and a use history of the external memory **200** accessed via the interface **104**. That is, the external memory measure unit **106** may measure a speed of data transmitted/received between the terminal **100** and the external memory **200** via the interface **104**, and measure a storable capacity, file records stored in advance, etc. with respect to the accessed external memory **200**.

The store determining unit **108** determines whether to store currently received contents in the external memory **200** based on a value measured by the external memory measure unit **106**. That is, the store determining unit **108** may determine whether to store the received contents in the external memory **200** based on a measured speed of the interface **104**, or determine whether to store the received contents based on whether the same contents as the currently received contents are stored in the external memory **200**, the storable capacity of the external memory **200**, or a combination of these.

When it is determined by the store determining unit **108** that the contents are stored in the external memory **200**, the transmission controller **110** controls to transmit the contents to the external memory **200** via the interface **104**.

The buffer **112** may store a multimedia streaming of contents received via a network. That is, a multimedia file such as a moving picture file, a sound file, etc. may be received in real-time in the form of streaming via the network. At this point, a unit of data received via the network is defined as a packet. The size of a packet may change depending on the kind of contents. In this example, the buffer **112** is intended for solving a speed difference between the speed of contents received via the network and a contents processing speed of the terminal **100**. The buffer **112** may temporarily store received contents for a set time. At this point, the store determining unit **108** may compare the speed of the interface **104** with the storing/deleting speed of the buffer **112**, or retrieve whether a space for storing contents remains in the buffer **112** to determine whether to store contents in the external memory **200**.

The streaming measure unit **114** may measure at least one of the speed of multimedia streaming, and the size of a packet with respect to contents received via the network. That is, in the case where a multimedia stream for contents such as moving pictures, sounds, games, etc. is received via the network, the streaming measure unit **114** may measure the speed of the received multimedia stream, the size of a packet, etc. In this example, the store determining unit **108** may compare a value measured by the streaming measure unit **114** with a

value measured by the external memory measure unit **106** to determine whether to store the contents in the external memory **200** on a packet basis.

In the case where a plurality of external memories **200** are accessed via the interface **104**, the external memory comparator **116** may compare at least one of an interface speed, an available capacity and a use history of each external memory **200**. For example, in the case where a plurality of USB memories are accessed via a USB interface, the external memory comparator **116** may compare an available capacity of each USB memory. Alternatively, in the case where a USB memory is accessed via the USB interface, and simultaneously, a short distance wireless communication memory is accessed via a short distance wireless communication interface, the external memory comparator **116** may compare an interface speed and an available capacity of each accessed external memory **200**.

The priority determine unit **118** may determine a priority of each external memory **200** accessed via the interface **104** depending on a comparison result by the external memory comparator **116**. For example, in the case where external memories are accessed via the USB interface and the short distance wireless communication interface, respectively, and respective available capacities are the same, and the speed of the USB interface is faster than the short distance wireless communication interface by a set value, the priority may be determined such that contents received via the network is primarily stored in the USB memory accessed via the USB interface and secondarily stored in the external memory accessed via the short distance wireless communication interface in the case where an available capacity of the USB memory is equal to or less than a set value. At this point, the priority determine unit **118** may determine a priority of each memory **200** with consideration of a speed difference of each interface, an available capacity difference of each external memory, and whether the same contents as received contents are stored in each external memory.

The contents retriever **120** retrieves whether the same contents as contents received via the network are stored in the external memory **200** accessed via the interface **104**. At this point, the contents retriever **120** may retrieve whether the same contents are stored in the external memory **200** on a packet basis with respect to a multimedia stream received on a packet basis.

The contents executor **122** may execute contents stored in the external memory **200** via the interface **104**. That is, contents may be transmitted to the external memory **200** by the transmission controller **110**, or in the case where the contents retriever **120** retrieves that the same contents as currently received contents are stored in the external memory **200**, the contents executor **122** may receive and execute the contents stored in the external memory **200** via the interface **104**.

The data size comparator **124** may compare the size of contents received via the network with an available capacity of the external memory **200** accessed via the interface **104**. At this point, the data size comparator **124** may compare the size of a packet with an available capacity of the external memory **200** with respect to contents received in the form of a multi-stream.

In the case where the available capacity of the external memory **200** is equal to or greater than the size of contents or the size of a packet, the external buffer determine unit **126** may determine a capacity to use as an external buffer among the available capacity of the external memory **200**. In this example, it is preferable that the size of a capacity to use as the external buffer is set to a value greater than the size of a packet of contents received in the form of a multi-stream.



In the case where the available capacity of the external memory **200** is less than the size of contents or the size of a packet, the delete history selector **128** may select a history to delete among a use history of the external memory **200**. At this point, the delete history selector **128** allows a user to select a delete history or allows contents to be sequentially deleted in a preceding order among contents of a packet basis stored in the external memory **200** by providing a use history of the external memory **200** in the form of a select menu to the user.

FIG. 2 illustrates a method for extending a storage space according to an exemplary embodiment of the present disclosure.

Referring to FIGS. 1 and 2, the contents receiver **102** may receive contents such as moving pictures, sounds, an image, etc. via a network, or transmit/receive game contents to/from other terminals via the network (**210**).

The buffer **112** may temporarily store a multimedia stream of received contents for a set time in order to solve a speed difference between the speed of the contents received via the network and the contents processing speed of the terminal **100** (**220**). At this point, the buffer **112** may store the multimedia stream of the received contents on a packet basis.

The streaming measure unit **114** may measure at least one of the multimedia streaming speed and a packet size with respect to contents received via the network (**230**). That is, when a multimedia stream of contents such as moving pictures, sounds, games, etc. is received via the network, the streaming measure unit **114** may measure the speed of the received multimedia stream, and the packet size, etc.

When the external memory **200** is accessed via at least one of a USB interface, a short distance wireless communication interface, and a network interface (**240**), the external memory measure unit **106** measures at least one of the speed of the interface **104**, an available capacity and a use history of the external memory **200** accessed via the interface **104** (**250**). At this point, the external memory measure unit **106** may measure the speed of data transmitted/received between the terminal **100** and the external memory **200** via the interface **104**, and measure a storable capacity, file records stored in advance, and whether the same contents as contents currently received via the network are stored with respect to the accessed external memory **200**.

The store determining unit **108** determines whether to store currently received contents in the external memory **200** based on a value measured by the external memory measure unit **106** (**260**). That is, the store determining unit **108** may determine whether to store the received contents in the external memory **200** based on the measured speed of the interface **104**, or determine whether to store the received contents based on whether the same contents as the currently received contents are stored in the external memory **200**, the storable capacity of the external memory **200**, or a combination of these.

Alternatively, the store determining unit **108** may compare a value measured by the streaming measure unit **114** with a value measured by the external memory measure unit **106** to determine whether to store contents in the external memory **200** on a packet basis.

Alternatively, the store determining unit **108** may compare the speed of the interface **104** with a store/delete speed of the buffer **112**, or retrieve whether a space for storing contents remains in the buffer **112** to determine whether to store contents in the external memory **200**.

When it is determined by the store determining unit **108** that contents are stored in the external memory **200** (**270**), the

transmission controller **110** controls to transmit the contents to the external memory **200** via the interface **104** (**280**).

The contents executor **122** may execute contents stored in the external memory **200** via the interface **104**.

Therefore, the speed of the multimedia stream of the received contents, the size of a packet, etc. are measured, and accordingly, the contents may be automatically transmitted to the external memory, and the contents stored in the external memory may be executed, so that the buffer may be automatically extended to the external memory in the case where the available capacity of the buffer installed inside the terminal is insufficient.

FIG. 3 illustrates a method for extending a storage space according to another exemplary embodiment of the present disclosure.

Referring to FIGS. 1 and 3, the contents receiver **102** may receive contents such as moving pictures, sounds, an image, etc. via a network, or transmit/receive game contents to/from other terminals via the network (**310**).

The streaming measure unit **114** may measure at least one of a multimedia streaming speed, and a packet size with respect to contents received via the network (**320**). That is, when a multimedia stream of contents such as moving pictures, sounds, games, etc. is received via the network, the streaming measure unit **114** may measure the speed, the packet size, etc. of the received multimedia stream.

The interface **104** may try an access by turning on the power of the terminal **100**, inserting a USB memory into the USB interface of the terminal **100**, or periodically retrieving an external terminal that can be communicated, existing within a predetermined range. At this point, the interface **104** may simultaneously access a plurality of external memories **200** (**330**). For example, the interface **104** may simultaneously access a plurality of USB memories connected via a plurality of USB interfaces, and simultaneously access a USB memory connected via the USB interface and the external memory **200** connected via a short distance wireless communication interface.

The external memory measure unit **106** measures at least one of the speed of each interface **104**, available capacities and use histories of respective external memories **200** accessed via a plurality of interfaces **104** with respect to respective external memories **200** connected via the plurality of interfaces **104** (**340**). That is, the external memory measure unit **106** may measure the speed of data transmitted/received between the terminal **100** and each external memory **200**, and measure a storable capacity, file records stored in advance, etc. with respect to the respective connected external memories **200**.

In the case where the plurality of external memories **200** are accessed via the interface **104**, the external memory comparator **116** may compare at least one of an interface speed, an available capacity, and a use history of each external memory **200** (**350**). For example, in the case where a plurality of USB memories are accessed via a USB interface, the external memory comparator **116** may compare the available capacity of each USB memory. Alternatively, in the case where a USB memory is accessed via the USB interface, and simultaneously, a short distance wireless communication memory is accessed via the short distance wireless communication interface, the external memory comparator **116** may compare an interface speed and an available capacity of each accessed external memory **200**.

The contents retriever **120** may retrieve whether the same contents as contents received via the network are stored in the external memory **200** accessed via the interface **104** (**360**). At this point, the contents retriever **120** may retrieve whether the

same contents are stored in the external memory **200** on a packet basis with respect to a multimedia stream received on a packet basis.

When it is retrieved by the contents retriever **120** that the same contents as the contents received via the network are not stored in any of the plurality of external memories **200**, the store determining unit **108** may determine whether to store the currently received contents in at least one of the plurality of external memories **200** (**370**).

At this point, the priority determine unit **118** may determine a priority of each external memory **200** accessed via the interface **104** depending on a comparison result by the external memory comparator **116** (**380**). In this example, the priority determine unit **118** may determine the priority of each external memory **200** with consideration of a speed difference of each interface, a difference in an available capacity of each external memory **200**, and whether the same contents as received contents are stored in each external memory.

In addition, the priority determine unit **118** may determine to store the received contents in an external memory **200** of a first priority depending on a determined priority for the plurality of external memories **200**, or determine to sequentially store the contents according to the priority (**390**). For example, in the case where external memories are accessed via the USB interface and the short distance wireless communication interface, respectively, and respective available capacities are the same, and the speed of the USB interface is faster than the speed of the short distance wireless communication interface by a set value or more, the priority determine unit **118** may determine the priority such that contents received via the network are primarily stored in the USB memory accessed via the USB interface and the contents are secondarily stored in the external memory accessed via the short distance wireless communication interface in the case where the available capacity of the USB memory is equal to or less than a set value.

The transmission controller **110** controls to transmit currently received contents to an external memory of a first priority among the plurality of external memories **200** or controls to sequentially transmit the contents depending on the priority determined by the priority determine unit (**395**).

In the case where the contents retriever **120** retrieves the same contents stored in at least one of the plurality of external memories **200** with respect to the contents received via the network, the store determining unit **108** may determine not to store the received contents in the external memory **200**. In this example, the contents executor **122** may execute the contents stored in the relevant external memory **200** (**397**).

Therefore, in the case where a plurality of external memories are accessed via the interface, a best method for the plurality of external memories may be selected, so that an external memory may be extended.

FIG. 4 illustrates a method for extending a storage space according to another exemplary embodiment of the present disclosure.

Referring to FIGS. 1 and 4, the contents receiver **102** may receive contents such as moving pictures, sounds, an image, etc. via a network, or transmit/receive game contents to/from other terminals via the network (**410**).

When the external memory **200** is accessed via at least one of the USB interface, the short distance wireless communication interface, and the network interface (**420**), the external memory measure unit **106** measures at least one of the speed of the interface **104**, the available capacity and the use history of the external memory **200** accessed via the interface **104** (**430**). At this point, the external memory measure unit **106** may measure the speed of data transmitted/received between

the terminal **100** and the external memory **200** via the interface **104**, and may measure a storable capacity, file records stored in advance, and whether the same contents as contents currently received via the network are stored with respect to the accessed external memory **200**.

The store determining unit **108** determines whether to store the currently received contents in the external memory **200** based on a value measured by the external memory measure unit **106** (**440**). That is, the store determining unit **108** may determine whether to store the received contents in the external memory **200** based on the measured speed of the interface **104**, or determine whether to store the received contents based on whether the same contents as the currently received contents are stored in the external memory **200**, the storable capacity of the external memory **200**, or a combination of these.

In the example where it is determined that the contents are stored in the external memory **200**, the data size comparator **124** may compare the size of the contents received via the network with the available capacity of the external memory **200** (**450**).

When it is determined by the data size comparator **124** that the available capacity of the external memory **200** is equal to or greater than the received contents (**460**), the external buffer determine unit **126** may determine a capacity to use as an external buffer among the available capacity of the external memory **200** (**470**). At this point, in the example where contents are received in the form of a multimedia stream of a packet basis, the external buffer determine unit **126** may determine the capacity of the external buffer equal to or greater than the packet size.

The transmission controller **110** controls to transmit contents received via the network to an external buffer inside the external memory **200** via the interface **104** (**480**). At this point, the contents executor **122** may execute the contents stored in the external buffer via the interface **104**, thereby extending the buffer using the external memory **200** in the example where the available capacity of the buffer **112** is insufficient with respect to received contents.

When it is determined by the data size comparator **124** that the available capacity of the external memory **200** is less than the size of received contents (**460**), the delete history selector **128** may select and delete a history to delete among a use history stored in advance in the external memory **200** (**490**). Therefore, in the example where the available capacity of the buffer **112** is insufficient and the available capacity of the external memory **200** is insufficient, a portion of a use history of the external memory **200** is deleted and the available capacity is extended, so that the external buffer may be extended.

According to an exemplary embodiment of the present disclosure, when large capacity contents such as moving pictures, games, etc. are received and executed via the network, an external memory is accessed via a USB interface, a short distance wireless communication interface, a network interface, etc. installed in a terminal, and a buffer required for reproducing the contents is extended using the accessed external memory, so that disconnection of the contents may be prevented.

In addition, according to an exemplary embodiment of the present disclosure, in the example where a user performs manipulation such as forward, backward, etc. on contents of the same content, the contents stored in an external memory may be reproduced even when the capacity of the buffer for storing streaming is insufficient, so that performing of repetitive buffering may be prevented.

It will be appreciated that embodiments of the present disclosure according to the claims and description in the

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specification can be realized in the form of hardware, software or a combination of hardware and software.

Any such software may be stored in a computer readable storage medium. The computer readable storage medium stores one or more programs (software modules), the one or more programs comprising instructions, which when executed by one or more processors in an electronic device, cause the electronic device to perform a method of the present disclosure.

Any such software may be stored in the form of volatile or non-volatile storage such as, for example, a storage device like a ROM, whether erasable or rewritable or not, or in the form of memory such as, for example, RAM, memory chips, device or integrated circuits or on an optically or magnetically readable medium such as, for example, a CD, DVD, magnetic disk or magnetic tape or the like. It will be appreciated that the storage devices and storage media are embodiments of machine-readable storage that are suitable for storing a program or programs comprising instructions that, when executed, implement embodiments of the present disclosure.

Accordingly, embodiments provide a program comprising code for implementing apparatus or a method as claimed in any one of the claims of this specification and a machine-readable storage storing such a program. Still further, such programs may be conveyed electronically via any medium such as a communication signal carried over a wired or wireless connection and embodiments suitably encompass the same.

Although the disclosure has been shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the disclosure as defined by the appended claims and their equivalents. Therefore, the scope of the present disclosure should not be limited to the above-described embodiments but should be determined by not only the appended claims but also the equivalents thereof.

What is claimed is:

1. A terminal configured to extend a storage space, the terminal comprising:

a receiver configured to receive contents via a network;

an interface configured to access at least one external memory; and

a controller configured to:

measure at least one of a speed and a packet size of a multimedia stream associated with the received contents,

measure at least one of a speed of the interface, an available capacity and a use history of the external memory accessed via the interface,

compare a value of the at least one of a speed and a packet size of the multimedia stream with a value of the at least one of the speed of the interface, the available capacity and the use history of the external memory to determine whether to store the contents on a packet basis,

determine whether to store the contents in the external memory based on the value of the at least one of the speed of the interface, the available capacity and the use history of the external memory, and

control to transmit the contents to the external memory via the interface when it is determined that the contents are to be stored in the external memory.

2. The terminal of claim 1, further comprising a buffer configured to store a multimedia stream for the received contents,

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wherein the controller is configured to determine to store the contents in the external memory when a capacity of the buffer is insufficient.

3. The terminal of claim 1, wherein the controller is further configured to:

when a plurality of external memories are accessed via the interface, compare at least one of an interface speed, an available capacity, and a use history of each external memory of the plurality of external memories; and determine a priority of each external memory depending on the comparison.

4. The terminal of claim 1, wherein the controller is further configured to determine whether stored contents that are the same as the received contents are stored in the external memory.

5. The terminal of claim 4, wherein the controller is further configured to execute contents stored in the external memory via the interface.

6. The terminal of claim 1, wherein the controller is further configured to:

compare a size of the contents with an available capacity of the external memory; and

when the available capacity of the external memory is equal to or greater than the size of the contents, determine a portion of the available capacity of the external memory to use as an external buffer.

7. The terminal of claim 6, wherein the controller is further configured to:

when the available capacity of the external memory is less than the size of the contents, select a history to delete among a use history of the external memory.

8. The terminal of claim 1, wherein the interface comprises at least one of:

a Universal Serial Bus (USB) interface configured to access the at least one external memory via a USB;

a short distance wireless communication interface configured to access the at least one external memory using short distance wireless communication comprising at least one of Bluetooth, Infrared Data Association (IrDA), Zigbee, Ultra Wideband (UWB), and Near Field Communication (NFC); and

a network interface configured to access a cloud server connected to the network using at least one of Wi-Fi, Code Division Multiple Access (CDMA), Wideband CDMA (WCDMA), Global System for Mobile Communication (GSM), Long Term Evolution (LTE), and Evolved Packet Core (EPC).

9. The terminal of claim 1, wherein the interface comprises a wireless network interface configured to access a cloud server connected to the network using a wireless connection.

10. A method for extending a storage space of a terminal, the method comprising:

receiving contents via a network;

measuring at least one of a speed and a packet size of a multimedia stream associated with the received contents,

accessing at least one external memory connected via an interface;

measuring at least one of a speed of the interface, an available capacity and a use history of the external memory accessed via the interface;

comparing a value of the at least one of a speed and a packet size of the multimedia stream with a value of the at least one of the speed of the interface, the available capacity and the use history of the external memory to determine whether to store the contents on a packet basis; and

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determining whether to store the contents in the external memory based on the value of the at least one of the speed of the interface, the available capacity and the use history of the external memory;

when determining to store the contents in the external memory, controlling to transmit the contents to the external memory via the interface.

**11.** The method of claim **10**, wherein the interface comprises at least one of:

a Universal Serial Bus (USB) interface for accessing the at least one external memory via a USB;

a short distance wireless communication interface for accessing the at least one external memory using short distance wireless communication comprising at least one of Bluetooth, Infrared Data Association (IrDA), Zigbee, Ultra Wideband (UWB), and Near Field Communication (NFC); and

a network interface for accessing a cloud server connected to the network using at least one of Wi-Fi, Code Division Multiple Access (CDMA), Wideband CDMA (WCDMA), Global System for Mobile Communication (GSM), Long Term Evolution (LTE), and Evolved Packet Core (EPC).

**12.** The method of claim **10**, further comprising storing a multimedia stream for the received contents in a buffer,

wherein determining whether to store the contents in the external memory comprises determining to store the contents in the external memory when a capacity of the buffer is insufficient.

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**13.** The method of claim **10**, further comprising:

when a plurality of external memories are accessed via the interface, comparing at least one of an interface speed, an available capacity, and a use history of each external memory of the plurality of external memories to form a comparison result; and

determining a priority of each external memory depending on the comparison result.

**14.** The method of claim **10**, further comprising determining whether stored contents that are the same as the received contents are stored in the external memory.

**15.** The method of claim **14**, further comprising executing contents stored in the external memory via the interface.

**16.** The method of claim **10**, further comprising:

comparing a size of the received contents with an available capacity of the external memory; and

when the available capacity of the external memory is equal to or greater than the size of the contents, determining a portion of the available capacity of the external memory to use as an external buffer.

**17.** The method of claim **16**, further comprising, when the available capacity of the external memory is less than the size of the contents, selecting a history to delete among a use history of the external memory.

**18.** The method of claim **10**, wherein the interface comprises a wireless network interface configured to access a cloud server connected to the network using a wireless connection.

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